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Geological Survey Branch

A SURVEY OF THE PLACER MINING INDUSTRY OF BRITISH COLUMBIA

By E. L. Faulkner and B. A. Gordon

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ABSTRACT

This Open File presents the results from a questionnaire mailed to placer miners active in British Columbia in 1985 and 1986. The purpose of the questionnaire was to obtain basic statistical information on placer miners and the placer mining industry in the province for the years 1981 to 1986, and some additional information for 1986.

A total of 868 questionnaires were mailed and 343 returns were processed, for a response of 39.5 per cent. The returns show that the industry spent an average of over $30.4 million per year during the period, ranging from $25.4 million in 1984 to $37.0 million in 1982. In 1986, expenditures were over $26.2 million, with 94 per cent of this being spent in British Columbia. Using a round-figure multiplier of two, placer miners were responsible for over $52 million in direct and indirect expenditures during the year. Approximately 3000 people worked on placer mines in 1986, with 90 per cent of these being British Columbia residents. The industry was dominated in numbers by hand operations or small mechanized operations processing less than 40 cubic metres of gravel per day, and in expenditures by a small number of large operations processing 200 cubic metres or more per day. Five per cent of operations in fact accounted for approximately 50 per cent of expenditures in the years studied.

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INTRODUCTION

Prior to this survey, little information was available on the nature, size and expenditures of the placer mining industry in British Columbia, or on the background of the average placer miner. Previous unpublished surveys had not been province-wide in scope and had failed to achieve a satisfactory response due to inclusion in the survey of questions on gold production or income. Placer miners are generally very reluctant to divulge such information.

We therefore attempted to secure a mailing list for placer miners throughout British Columbia and, through contacts with placer miners during the 1986 field season, we established that a survey of the type adopted, omitting questions on production or income, would probably be favourably received. The response confirmed this expectation.

The economic impact of placer mining on the economy of the province has been considered in general terms only. Others with the appropriate expertise may wish to develop a socio-economic model specific to the placer mining industry in British Columbia, and use our data to produce a more detailed analysis.

THE SURVEY

THE QUESTIONNAIRE AND THE RESPONSE

A mailing list of 868 placer miners who had submitted a Form 6/7 Notice of Work (Placer) to Inspection District Offices in 1985 or 1986 was prepared from Inspection Branch records. A questionnaire was mailed early in 1987, and a reminder mailed to those who had not responded approximately six weeks later. A copy of the questionnaire is included as Appendix 1. The returns are summarized below:

	Number	Per Cent
Questionnaires mail	868	100.0
Returned "Undelivered" by Canada Post	42	4.8
Returned with little or no data	18	2.1
Returned too late for processing	12	1.4
Returned and processed	343	39.5

CONFIDENTIALITY OF RETURNS AND DATA

A mailing list number was removed from each questionnaire as it was received, whereupon the return became anonymous. The returns were then coded and the data entered into a microcomputer for processing. Each questionnaire was given an arbitrary number for computer-tracking purposes.

To further protect the identity of the respondents, Mining Districts having six or fewer respondents are combined with other Mining Districts to form larger regional groupings. Some data are also omitted, grouped, or presented in modified form in the tables and figures that follow, where it is felt that a person with local knowledge might be able to identify a respondent from the data - for example, the maximum expenditure on a particular commodity might identify the only large operator in a small district.

RELIABILITY OF THE DATA

The mailing lists supplied by the Prince George and Smithers Inspection District Offices are considered complete, and represent 77 per cent of the provincial total. The names of some operators active in 1985 but not in 1986 may be missing from lists supplied by other District Offices, and the mailing list from the Vancouver District Office is known to be incomplete. These deficiencies, estimated at no more than 25 miners, were discovered too late to be corrected.

Because of the high percentage of returns, the majority of means (i.e. averages or arithmetic means) calculated from the sample population can be considered equal to the means for the total population for all practical purposes. The maximum errors of estimates are generally less than one half standard deviation at the 99 per cent confidence level.

It was quickly apparent that returns from the larger operations had a disproportionate effect on calculations of expenditures for the province as a whole. The percentage of survey returns from operations processing more than 200 cubic metres of gravel per day was 32.4 per cent, whereas the percentage of such operations calculated from information supplied by miners on their Notices of Work was significantly higher, at 39.5 per cent. Using the average spending reported by operations of this size, it was estimated that calculated spending totals for the province are probably low by 5 per cent.

RESULTS

RETURNS BY MINING DIVISION

As can be seen from the Questionnaire, Appendix 1, some of the questions refer specifically to 1986, while others refer to the period 1981 to 1986. Unless indicated otherwise, the discussions and illustrations that follow refer to 1986.

The breakdown of the returns processed by Mining Division is given in Table 1. Mining Divisions not listed either do not have any Designated Placer Areas, or else no returns were received from them. The returns were consolidated into eight largely traditional regional groupings: Atlin, Cariboo, Kamloops, Liard, Nelson, Omineca, Southeast and Southwest. These will be referred to as "Mining Regions" in the sections that follow. Table 2 gives the number of returns for each region, and Figure 1 shows these regions on an outline map.

Table 1. Returns by Mining Division

MINING DIVISION	RETURNS
ATLIN	21
CARIBOO	190
CLINTON	5
FORT STEELE	22
GREENWOOD	6
KAMLOOPS	2
LIARD	19
LILLOOET	9
NELSON	3
OMINECA	34
REVELSTOKE	6
SIMILKAMEEN	13
SKEENA	2
NEW WESTMINSTER	5
VANCOUVER ISLAND	4
VERNON	2
TOTAL	343

Table 2. Returns by Mining Region

MINING DIVISION	MINING REGION	RETURNS
ATLIN	ATLIN	21
CARIBOO	CARIBOO	190
CLINTON KAMLOOPS LILLOOET REVELSTOKE VERNON	KAMLOOPS	24
LIARD	LIARD	19
GREENWOOD NELSON SIMILKAMEEN	NELSON	22
OMINECA SKEENA	OMINECA	36
FORT STEELE	SOUTHEAST	22
NEW WESTMINSTER VANCOUVER ISLAND	SOUTHWEST	9
	TOTAL	343

PLACER MINING EXPERIENCE

The placer mining experience reported for Question 2 ranged from 1 to over 50 years. The average was 8.6 years and the median 6 years. Figure 2 shows the experience reported by mine size and status, and Figure 3 shows the experience reported by mining region. Note that operators of the larger placer operations reported lower than average experience. This reflects in the regional picture also, as many of the province's larger placer mines are in the Atlin region.

OCCUPATIONAL BACKGROUND, PART-TIME AND ALTERNATE EMPLOYMENT

A large number of occupations were naturally reported for Question 4 - occupation before placer mining, Question 5 - part-time occupation, and Question 6 - alternate occupation if the respondent were not placer mining. These were grouped into the following 13 general occupational fields:

Construction	- civil, commercial, residential, industrial
Gas and Oil	
Government	- federal and provincial civil service, teachers, military
Logging	- all forest-related industries
Mining	- non-placer mining - see comment following
Miscellaneous	
Professional	
Resource	- farming, fishing, trapping, tourism
Retired	
Retail Business	
Support	- equipment supply, service and maintenance
Transportation	
Unemployed	

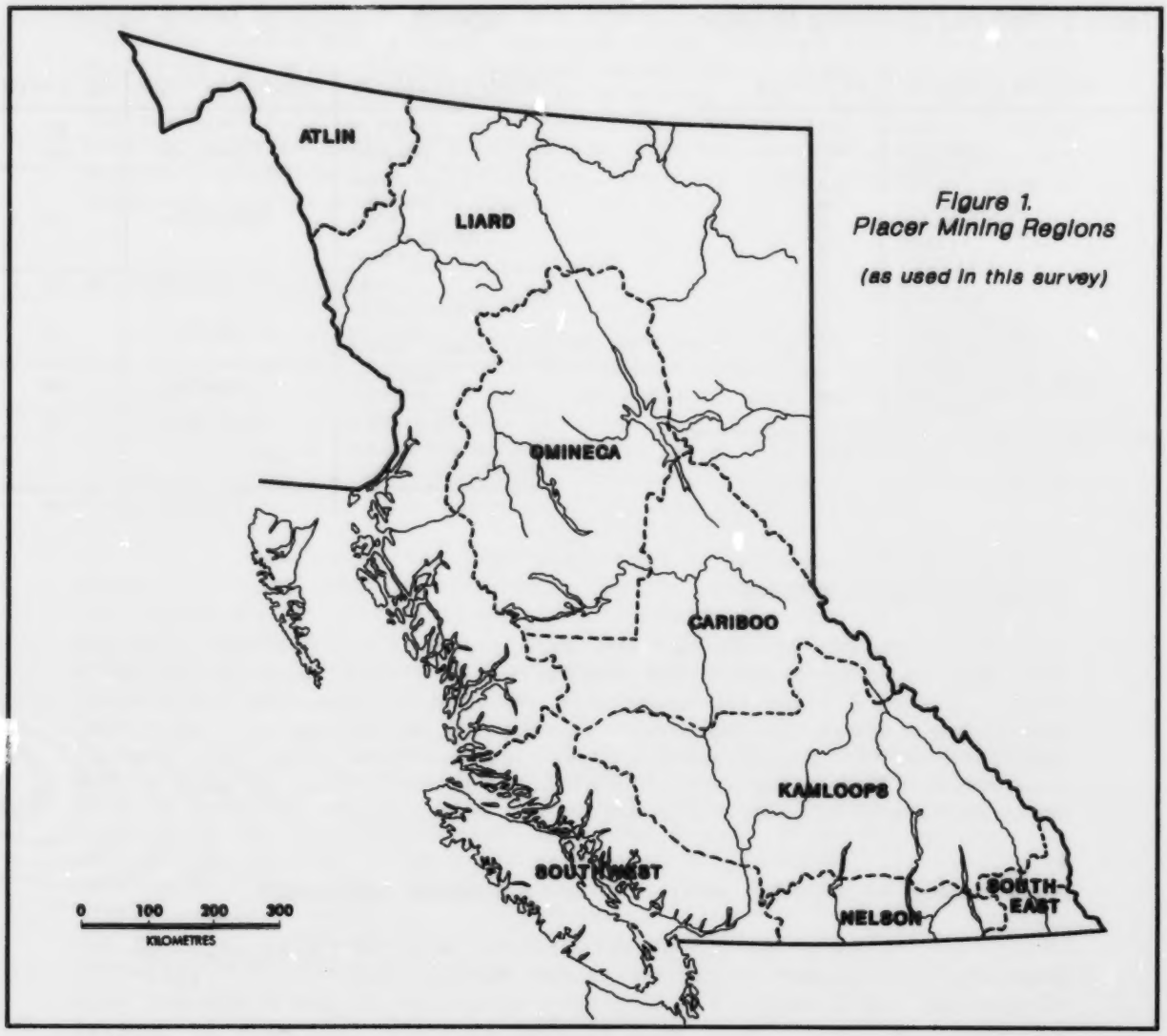

Figure 1.
Placer Mining Regions

(as used in this survey)

Several respondents gave "placer mining" as the answer for Questions 3, 4, or 5, presumably to indicate that placer mining was or has been their only source of employment. We presume that some respondents who just gave "mining" as their answer also implied this, as the reported number of miners (hardrock or coal) is much higher than our field experience suggests. The responses to Questions 3, 4 and 5 are given in Figures 4, 5, and 6 respectively. They show that roughly half the placer miners have prior occupational experience operating or servicing heavy equipment, or some familiarity with heavy equipment operations. It is also clear that placer mining appeals to people in their retirement years, with one in five miners stating they would otherwise be retired.

DISTANCE OF RESIDENCE FROM MINE

The responses to Question 6 show that 28.9 per cent of owners or operators live within 50 Kilometres of the mine, 20.4 per cent live between 50 and 200 Kilometres, 37.3 per cent live more than 200 Kilometres distance but in British Columbia, and 13.4 per cent are non-resident. The majority of owners or operators appear to prefer the advantages of living in more urbanized areas and the comparative ease, if not the cost, of travel or an annual mobilization to the mine, to any perceived advantages of living on or near the mine site. As will be seen later, the location of the residence also influences the owner's or operator's spending patterns.

LEVEL OF OPERATION IN 1986

The level of operations for the province is given in Table 3. This tabulation shows that the Atlin region, although it has only 6 per cent of the province's placer mines, has 20 per cent of all operations processing between 40 and 199 cubic metres of gravel per day, and 38 per cent of all operations processing more than 200 cubic metres per day.

Table 3. Level of Operations

The percentage of each category of operation by Mining Region is shown vertically in the top part of the table. The provincial percentage of each category is shown below.

MINING REGION	1	2	3	4	5	6	7	- STATUS OR SIZE
ATLIN	4.6	3.6	3.3	3.0	20.0	57.1	16.7	1 - INACTIVE
CARIBOO	70.4	55.5	52.7	45.5	64.0	28.6	33.3	2 - HAND OPERATION
KAMLOOPS	4.5	6.6	5.5	9.1	8.0	0.0	16.7	3 - TESTING
LIARD	2.3	3.6	8.8	12.1	4.0	0.0	0.0	4 - <40m3/day
NELSON	4.5	10.9	4.4	3.0	4.0	14.3	0.0	5 - 40-199m3/day
OMINECA	13.7	6.6	14.3	21.2	0.0	0.0	16.7	6 - 200-450m3/day
SOUTHEAST	0.0	9.5	7.7	3.0	0.0	0.0	16.6	7 - >450m3/day
SOUTHWEST	0.0	3.7	3.3	3.0	0.0	0.0	0.0	
TOTAL	100	100	100	100	100	100	100	
PROVINCIAL PERCENTAGE	12.8	40.0	26.5	9.6	7.3	2.0	1.8	- 100

TIME SPENT ON MINE BUSINESS AND MINING OPERATIONS

The figures given for Questions 8, 9 and 10 are complicated by the fact that many respondents, particularly those with hand operations or testing programs, indicated that they were active "part time" or "weekends only". The time spent on mine business is given in Figure 7 by mining region.

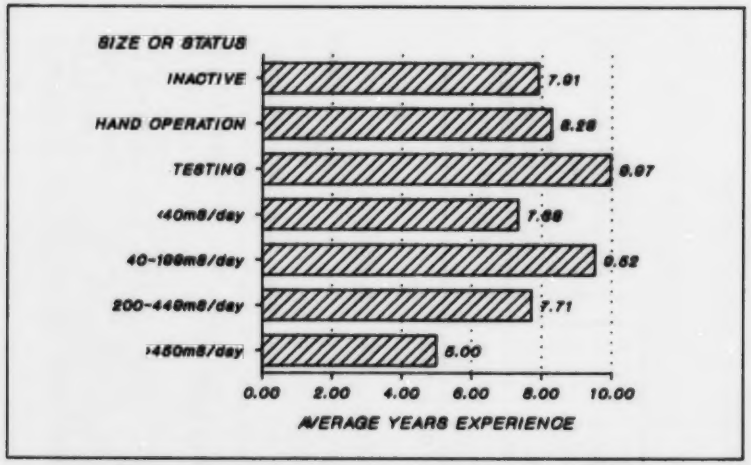

Figure 2. Experience by Mine Size or Status

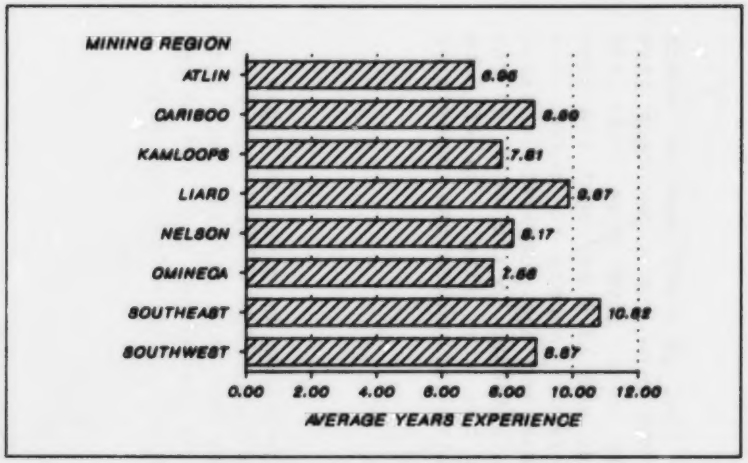

Figure 3. Experience by Mining Region

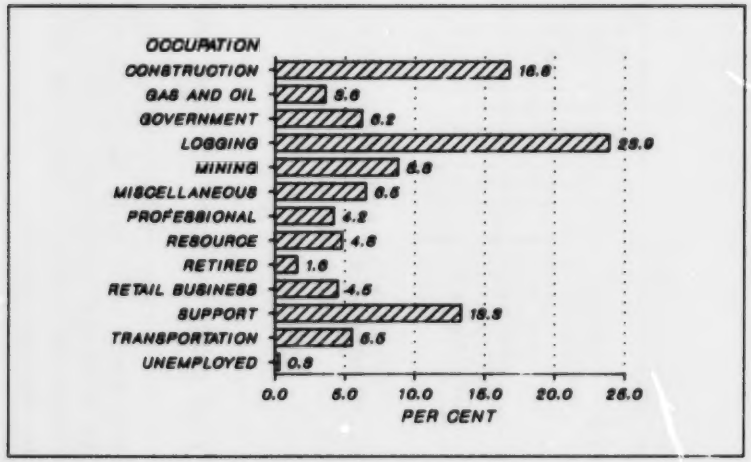

Figure 4. Prior Occupation

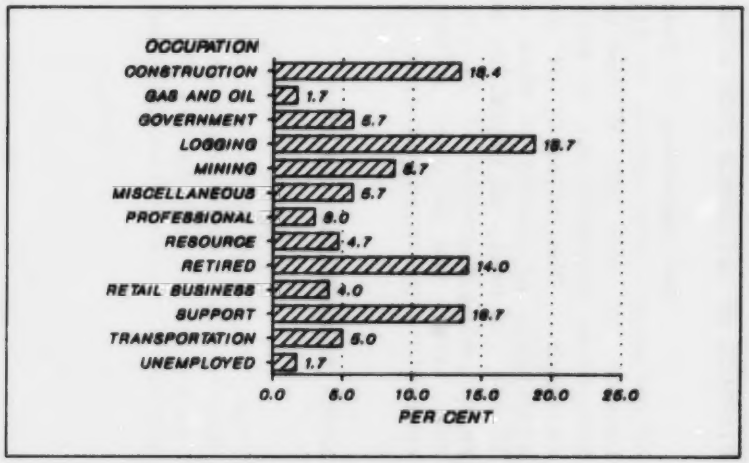

Figure 5. Part Time Occupation

With the exception of the southwest region, placer mines opened generally during the first half of May, and closed in the last half of August. The southwest region reported an average opening in late February and a closing in late July. The average length of the field season, as calculated from these data, is given in Figure 8.

Only 60 per cent of respondents completed Question 11, the number of days processing pay gravel. The most likely reason for this is the general reticence of placer miners when it comes to any question relating to production. The results are given by mining region in Figure 9 and by mine size in Figure 10. The time spent processing pay gravel increases, as might be expected, with the size of the operation, with the notable exception of the larger operations. This, plus the lower than average experience reported by operators of the larger operations (Figure 2), is consistent with a pattern frequently shown by placer miners who are relatively new to the industry. They start with a small operation, say 50 cubic metres per day, and on finding it to be profitable, feel that if they increase production to 250 or 500 cubic metres per day, they will be 5 or 10 times as profitable. The results of such attempts increase the size of a placer operation are often disappointing. The majority of the province's placer deposits do not appear to contain the large volumes of pay gravel needed to support large operations.

PERSONNEL IN PLACER MINING OPERATIONS

There were some discrepancies in the information given for Questions 12 and 13. We intended that Question 12 should include all people other than the respondent who worked on the mine, and that Question 13 apply to paid employees only. We suspect however, that some respondents included people who were not paid employees in the time-distance matrix of Question 13. The most common discrepancy was for there to be more people listed in the time-distance matrix of Question 13 than the number listed in Question 12. We concluded that respondents had included themselves in Question 13 when there was one extra person listed who had worked as long as the respondent (Question 8) and lived the same distance from the mine (Question 6), and we adjusted the matrix accordingly. If this did not resolve the discrepancy, then the entry for Question 13 was rejected.

The results indicate that an estimated total of 2981 people worked on placer mines at some time during 1986, or an average of 3.43 people per operation. A total of 1284 of these are listed as paid employees, or an average of 1.48 per operation. Figure 11 shows the expected increase in the number of employees with increasing size of operation. Each employee worked an average of 2.66 man-months, for a provincial total of 3424 man-months. Our field contacts indicate that non-employees working at placer mines are typically spouses, family members and partners. The distribution of placer miners and paid employees by mining region is given in Figure 12.

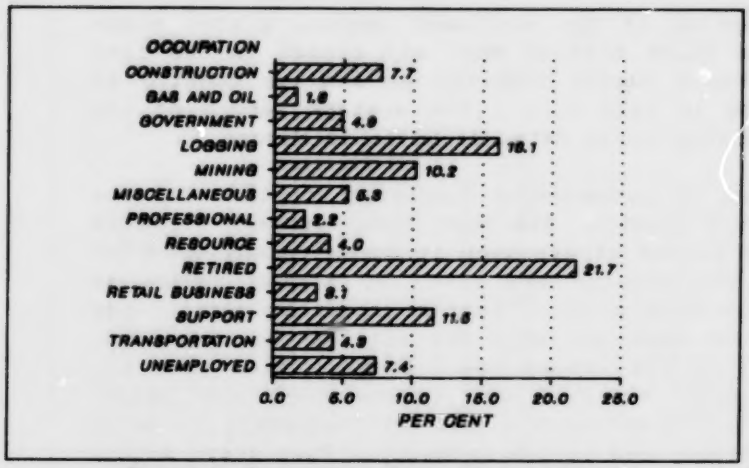

Figure 6. Occupation If Not Placer Mining

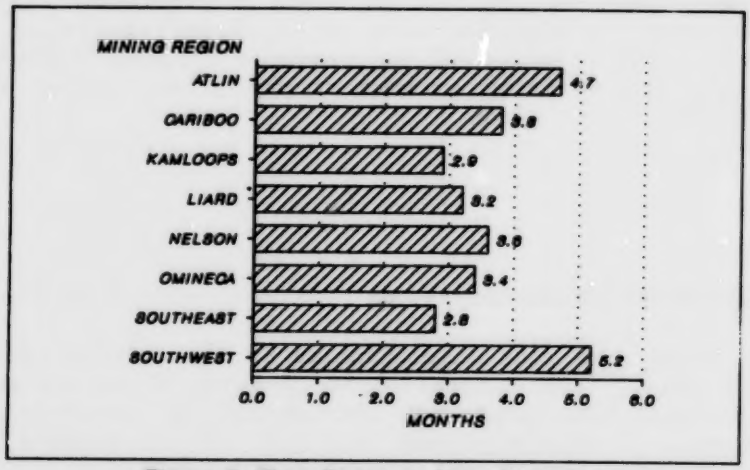

Figure 7. Time Spent on Mine Business

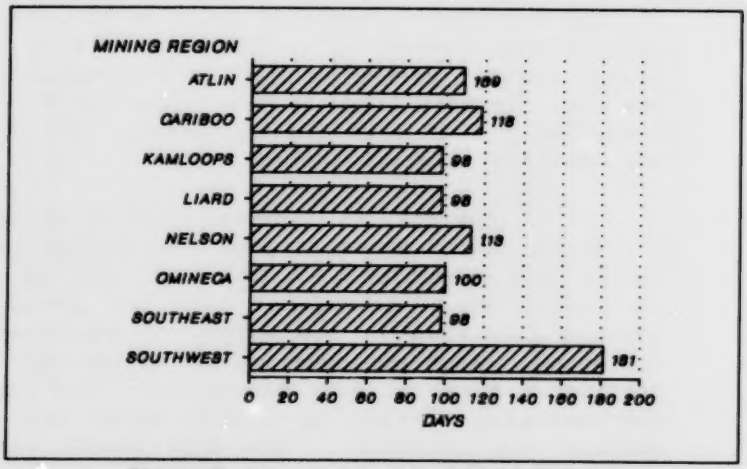

Figure 8. Average Length of Field Season

EQUIPMENT

Question 14 elicited the widest range of responses of the entire questionnaire. There was of course, not only a great variety of equipment types reported, but also a considerable variability in the amount of detail provided. Some respondents provided information in meticulous detail, while approximately 20 per cent provided little or no information. Most respondents gave the year of acquisition of major items such as bulldozers, excavators and loaders, but only a third provided the model year. Fewer than five per cent indicated the purpose for which the equipment was acquired, if not for placer mining.

The perception of what was a major item of equipment also varied with the size of the operation. Hand operators for example, listed items such as shovels and wheelbarrows, while operators processing 200 cubic metres or more of gravel per day often did not list trucks, welders and other items that they undoubtedly owned. The equipment was grouped into eight categories. More elaborate equipment groupings were tried, but failed to show any regional or other variations worthy of note.

The categories are summarized as follows:

Major Earth-moving Equipment

Bulldozers
Excavators
Loaders

Other Equipment

Miscellaneous Items	- drills, generators, hand tools, welders, winches.
Pumps	- all types including suction and dredge pumps.
Trailers	- camp, service and shop trailers, motor homes.
Vehicles	- all-terrain vehicles, dump trucks, pickup trucks, tandem trucks, tractor-trailer trucks.
Washplants	- classifiers, custom and proprietary clean-up systems conveyors and mechanical feeders, derockers, drum separators, jigs, sluice boxes, spirals, tables, trommels, vibrating grizzlies and screens.

The size of bulldozers in the following tables are Caterpillar Tractor sizes, e.g. D-6, D-8, or the closest equivalent Caterpillar tractor size for other makes. Excavator and loader sizes refer to the bucket capacity in cubic yards. The average number of items owned in each of these categories, and the sizes of the major earthmoving machines, are given in Table 4, by mine size or status. No regional differences or preferences were apparent.

The average model year of the major items of earthmoving equipment was 1966 for bulldozers, 1972 for excavators and 1971 for loaders. This fully confirms our field observations that the major equipment items used by the majority of placer miners tend to be

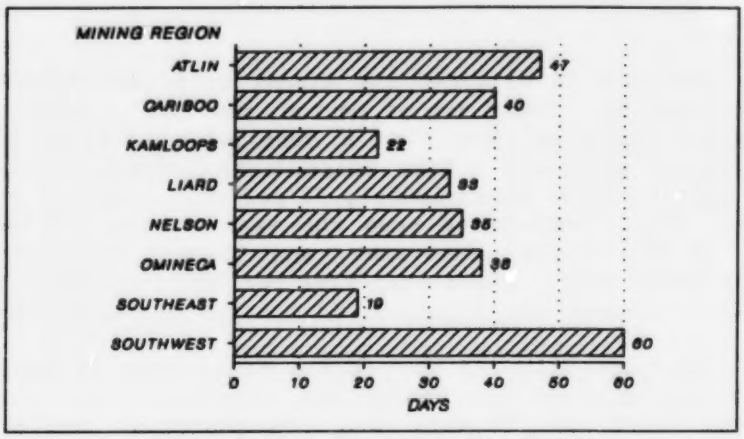

Figure 9. Days Processing Pay Gravel (by Mining Region)

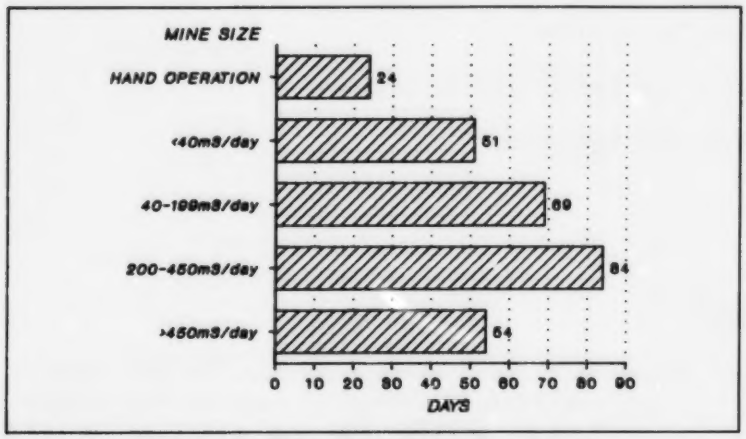

Figure 10. Days Processing Pay Gravel (by Mine Size)

elderly, and to have seen better days. We estimate that at least one third of mechanized operations are not producing at any given time due to mechanical problems.

It is a common field observation that placer miners acquired much of their heavy equipment in their prior occupations. The limited data obtained support this observation, with 14 respondents indicating that the purpose of purchase was "construction", 13 respondents indicating "logging" and 4 respondents indicating "farming".

EXPENDITURES

The amount of detail provided for Question 15 also varied considerably. We received returns with figures prepared by accountants, usually for the larger operations, that were correct to the nearest cent

Table 4. Equipment Items and Sizes by Mine Size or Status

EQUIPMENT	1	2	3	4	5	6	7
BULLDOZERS	1.25	1.8	1.10	1.5	1.24	1.00	1.50
(Size)	6.2	5.11	6.10	5.57	7.00	7.33	8.22
EXCAVATORS	1.07	1.08	1.27	1.25	1.22	1.29	1.20
(Size)	1.20	0.48	0.98	1.12	1.18	1.58	2.42
LOADERS	1.14	1.14	1.14	1.22	1.14	2.20	2.80
(Size)	2.28	1.06	1.47	1.60	2.50	4.23	3.42
MISCELLANEOUS	3.09	1.45	1.14	2.00	2.00	1.67	2.00
PUMPS	2.00	1.60	2.06	2.43	2.52	1.83	1.20
TRAILERS	1.46	1.10	2.00	1.47	2.06	2.40	3.30
VEHICLES	1.57	1.12	2.60	1.64	1.83	2.33	2.00
WASHPLANTS	1.61	1.87	2.07	2.10	2.64	2.67	2.90

1 - INACTIVE
2 - HAND OPERATION
3 - TESTING
4 - <40m3/day
5 - 40-199m3/day
6 - 200-450m3/day
7 - >450m3/dAY

for every category of expenditure for all six years requested, and returns with just a few figures that respondents indicated were approximate estimates only. A few returns gave total expenditures only and these were included in the provincial total estimates. There were some problems caused by the wording of Question 15 that we did not anticipate. Most were due to miners keeping expenditures in different groupings from those requested, for example some miners grouped "Fuel" with "Supplies", or "Supplies" with "Other Expenses."

A few miners made notations giving expense totals for subcontracts, for which there was no appropriate category in the question. We chose to add these amounts to the "Other Expenses" category. A few miners indicated that the totals for "Services", "Other Expenses" or "Labour" included subcontract amounts, and doubtless other miners included subcontracts in various categories without making notations to that effect. Unfortunately, the "Labour" category includes one known and probably sizeable subcontract from one of the province's larger operations, and comparison of the amounts reported by other miners with the number of employees reported suggest that several respondents included subcontracts or "machine plus operator" type costs in this category. The result is that the provincial total for "Labour" is far higher than the workforce would suggest.

Several miners worked leases owned by others, on a royalty basis, and naturally included their expenses with the "Fees, Permits and Royalties" category. Our intention had been to keep this category strictly for monies accruing to the province.

At least 20 per cent of all respondents, however, underestimated their expenditures in this category, often leaving this category blank. Inactive miners for example, must pay currently $300 per lease annually to keep a lease in good standing. Mechanized operators must spend a minimum of $100 for a water licence, a minimum of $25 for a Free Miner Certificate and pay a fee of $50 per lease to record physical work, for a minimum of $175 per year for a one-lease operation. The provincial totals calculated for this category must therefore be considered low, and the figures compiled by the Titles Branch should be consulted for more accurate data.

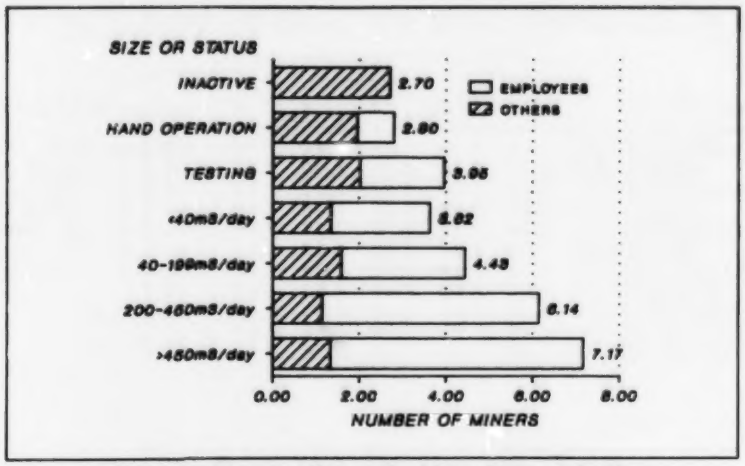

Figure 11. Placer Miners by Mine Size or Status

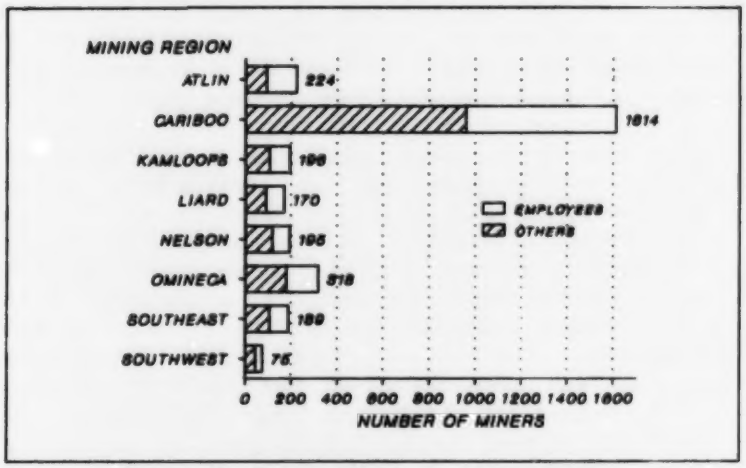

Figure 12. Placer Miners by Mining Region

Many respondents who reported that they were inactive in 1986 nevertheless listed expenditures for the year, usually for equipment purchase or maintenance, and supplies. Inactive respondents are therefore included in the expenditure tabulations.

The provincial estimates of expenditures for 1986 were based on the sample population of 868. The provincial estimates for the years 1981 to 1985 were based on Notice of Work totals for the respective years. The numbers used are as follows:

Year:	1981	1982	1983	1984	1985
Notices of Work:	681	803	1072	896	767

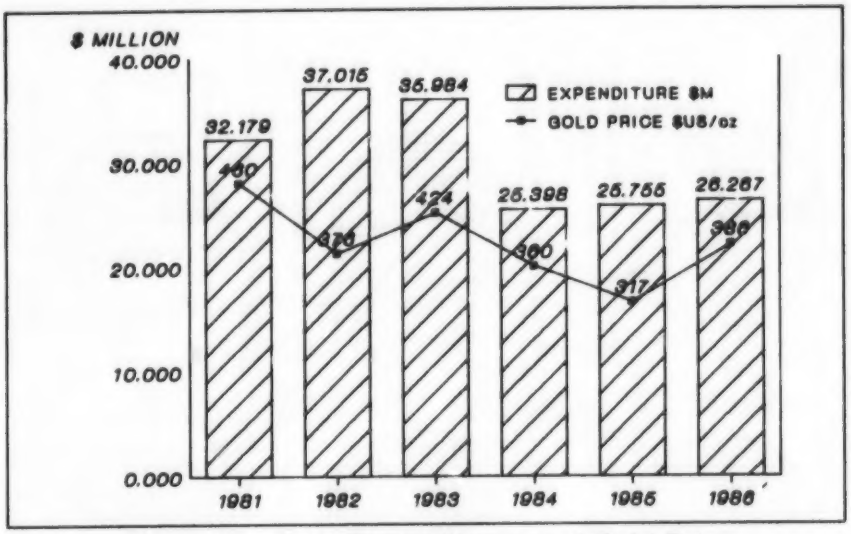

Figure 13. Total Expenditures and Gold Price

The estimated total expenditures are given in Figure 13, together with an averaged price of gold during the period. The number of placer operations and the consequent spending by the industry does not closely follow the price of gold. The increase in operations or spending in 1982 and 1983 may reflect the general downturn in the economy in the early 1980s, with small operators and contractors in the forest, construction and other industries, who had equipment available, turning to placer mining.

The expenditures for each year in the eight categories of Question 15 are given in Figure 14, and expenditures for each year in the eight mining regions are given in Figure 15. The Atlin region, by virtue of having mostly large to very large operations, dominated the expenditure totals in four of the six years studied. Expenditures by mine status or size are given in Figure 16.

PERCENTAGE OF COMMODITIES PURCHASED VERSUS DISTANCE FROM MINE

Figure 17 shows the weighted percentages of the six commodities of Question 16 purchased in the four distance categories. These percentages were calculated from the individual expenditures and the percentages for each distance category reported by each respondent. It would be expected that purchases in any region generally reflect the distance of suitable sources of supply from the mine site, but an analysis of the data by mining region revealed some unexpected results. In the Kamloops region for example, 87.8 per cent of the total expenditures made by miners in the region were made at distances over 200 Kilometres from the mine, despite the central location of a major urban supply centre - the city of Kamloops. This could be due to ease of access to the more extensive and possibly more competitive Lower Mainland sources, but it was found that there was a good correlation between the reported distance of the respondent's residence from the mine, and the percentage of purchases made at this distance. This has

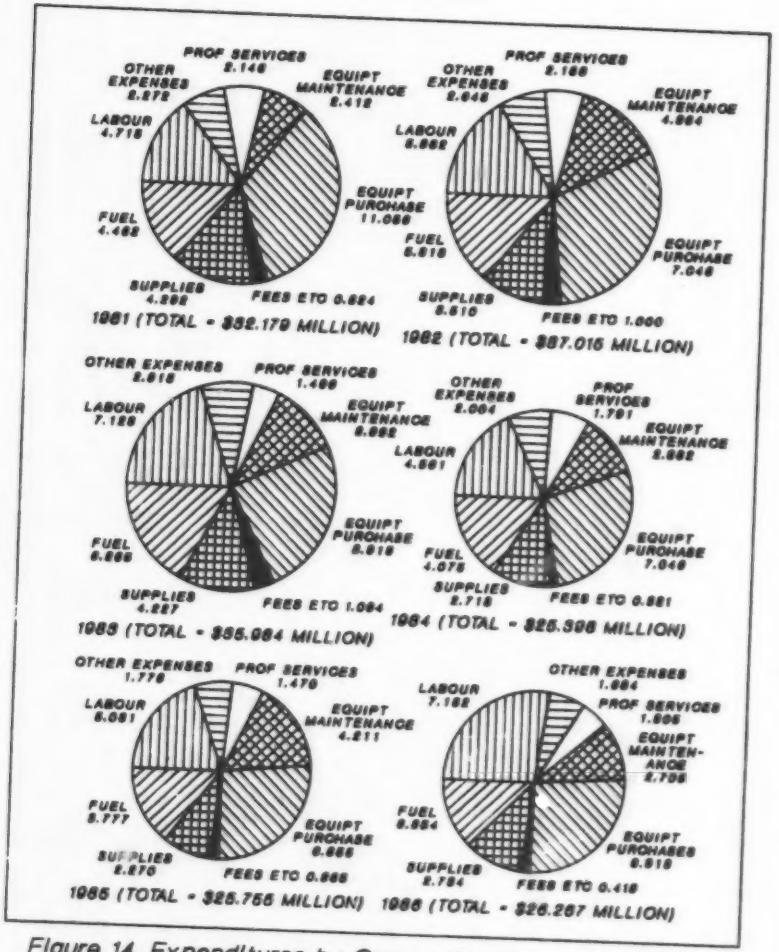

Figure 14. Expenditures by Commodity 1981-86 ($ Million)

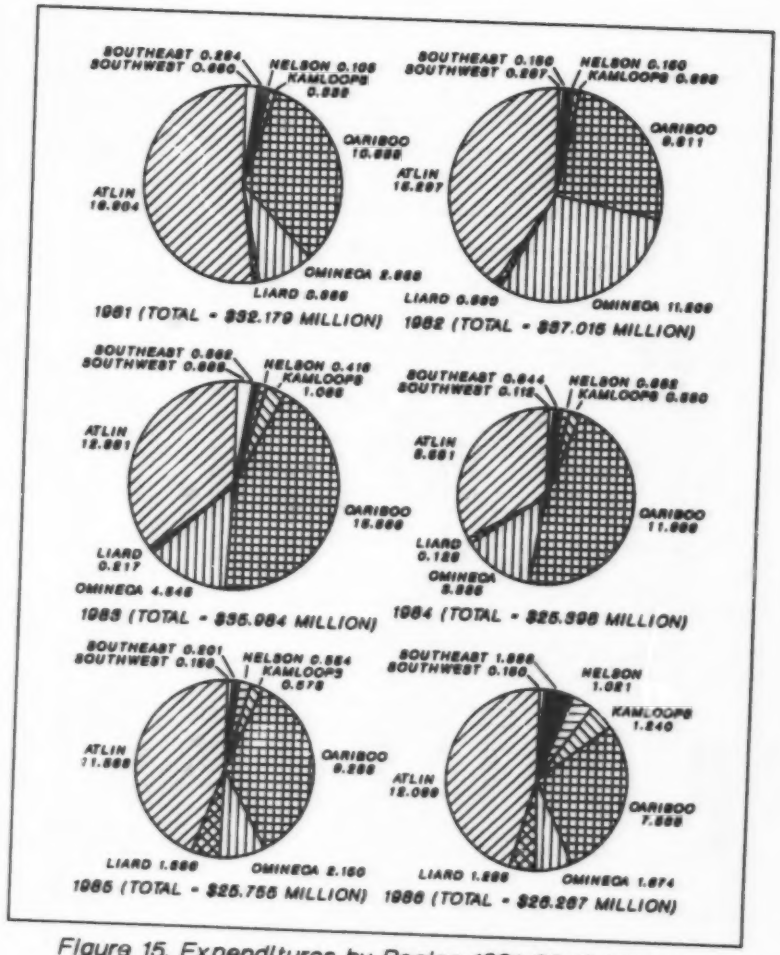

Figure 15. Expenditures by Region 1981-86 ($ Million)

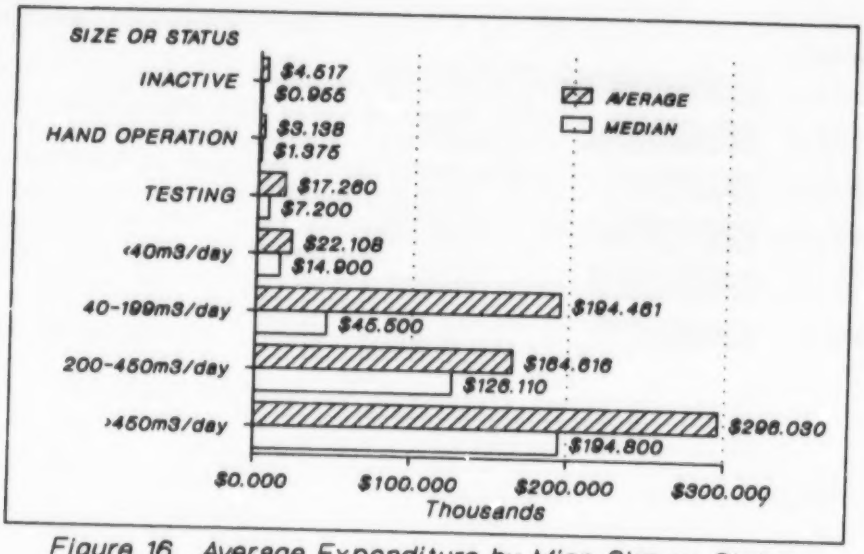

Figure 16. Average Expenditure by Mine Size or Status

been illustrated in a stacked bar diagram, Figure 18, which shows the percentage of residences in the four distance categories on the left, and the weighted percentage of purchases made at that distance on the right.

This strongly suggests that placer miners tend to use sources of supply close to their residences for a large proportion of their mining needs. The most likely reasons for this are familiarity with local sources of supply, established accounts or credit with local suppliers, and the fact that most of the year, including the pre-season preparation time, is spent at the residence.

An analysis of spending patterns by commodity within each mining region shows that "Fuel" was most commonly obtained locally, followed by "Supplies" and "Equipment Maintenance". "Supplies", "Equipment Maintenance" and "Fuel", in that order, were most commonly obtained between 50 and 200 Kilometres from the mine and "Equipment Purchase or Rental", "Services" and "Other Expenses" were most commonly obtained at distances greater than 200 Kilometres.

The dollar expenditures in the four distance categories for 1986 are given in Figure 19. A total of $7.72 million, exclusive of labour, fees or royalties, was spent within 50 Kilometres, and a further $5.71 million was spent between 50 and 200 Kilometres of the mine site. This clearly is an important contributor if not the major contributor to the economy of smaller communities such as Atlin, Dease Lake, Germansen Landing, Horsefly, Likely, Manson Creek and Wells, that are located in the larger placer regions, as well as to urban centres peripheral to placer regions such as Quesnel and Williams Lake.

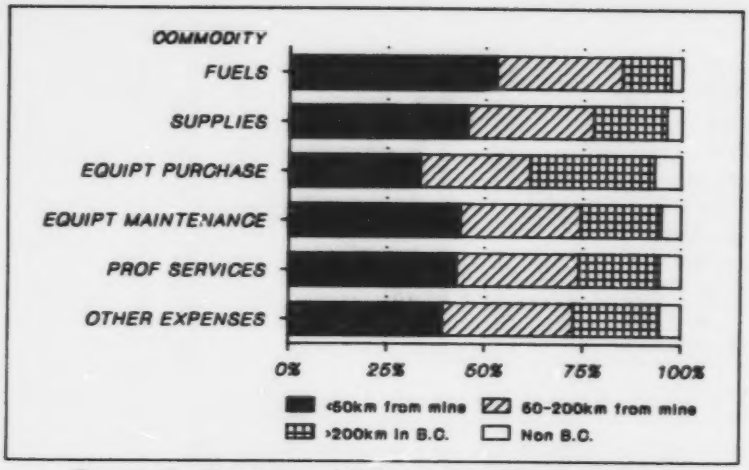

Figure 17. Purchases Made vs Distance From Mine

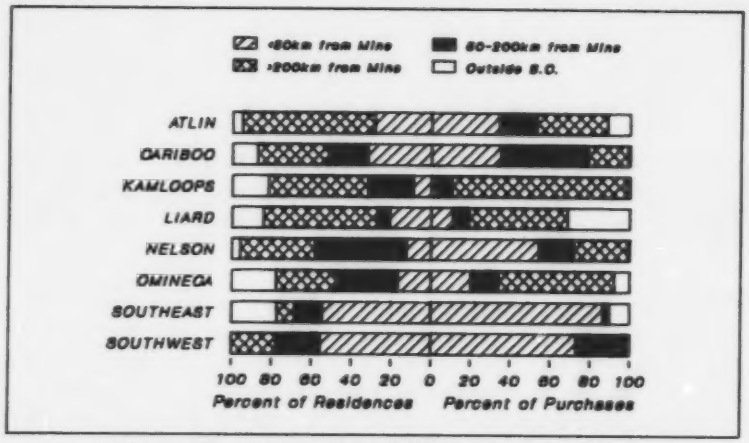

Figure 18. Distance of Residence From Mine and Distance of Purchases From Mine

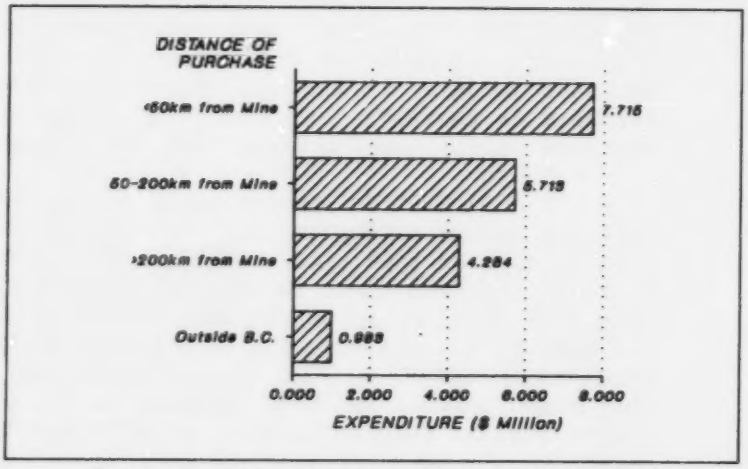

Figure 19. Expenditures vs Distance From Mine

EXPENDITURES ON EXPLORATION

A total of $13.37 million was spent on exploration, mostly by testing, during the six years studied. Very little information on the actual year of expenditure was provided. This total would be included in one or more of the expenditure categories of Question 15 and does not therefore represent additional expenditures during the period. It represents 7.32 per cent of total expenditures or an average of $2567 per mine per year. Figure 20 gives the expenditures for the four categories - "Drilling", "Geophysics", "Consultants" and "Testing". There were too few respondents for a detailed breakdown such as by mining region or mine status.

Although many of the province's placer mines are recreational or small operations, the amounts spent on exploration, and particularly on consultants, appear low from the point of view of geological or engineering considerations. Field observations confirm that inadequate testing or inappropriate mining methods are frequent causes of disappointment or unprofitable results in placer mining. Field observations also indicate that few exploration companies or consultants have experience or expertise in placer exploration, or are actively seeking to do business in the placer industry, with the result that money spent on exploration or choice of mining method often lacks a proper technical rationale.

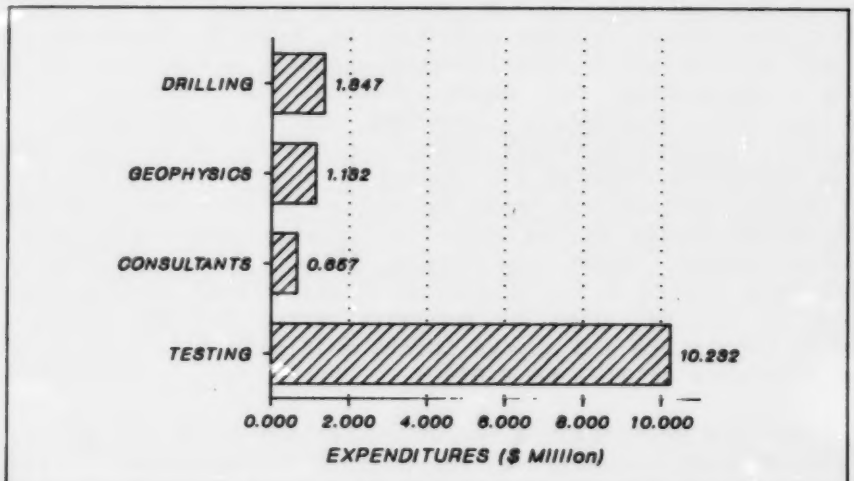

Figure 20. Expenditures on Exploration (1981-1986)

UPGRADING OF OPERATIONS

A total of $6.54 million was spent upgrading mining operations in the six year period, or an average of $1256 per mine per year. Again, these expenditures would be included in the totals for Question 15. The equipment items reported, by percentages, are as follows:

Equipment	Per Cent
Vibrating screens	23.9
Trommels	22.2
Mechanical feeders	12.0
Vibrating grizzlies	11.4
Proprietory gold separating devices	10.2
Miscellaneous classifiers	7.2
Drum and centrifugal separators	4.2
Miscellaneous equipment	4.1
Jigs	3.0
Spirals	1.8
TOTAL	100.0

It is apparent that equipment commonly used in other mining operations to make gravity separations of minerals, such as drum or centrifugal separators, jigs, spirals and shaking tables, has not been widely adopted by the placer mining industry.

DISCUSSION OF RESULTS AND CONCLUSIONS

As stated before, it was not the purpose of this survey to consider the economic impact of placer mining on the economy of the province in any detail. In the absence of a specific economic impact model for the placer mining industry in British Columbia, economic multipliers appropriate to the industry probably lie within the range of multipliers determined for other seasonal or resource industries. Information and references provided by P. Ostergaard, Senior Coordinator, Projects Analysis Branch, Ministry of Energy, Mines and Petroleum Resources, mostly for forest industry case studies, gave a range of income multipliers (wage and salary dollars generated for every wage and salary dollar in the resource industry) and output multipliers (additional dollars spent for every dollar spent in the resource industry) from 1.3 to 3.0. A survey of the placer mining industry in the State of Alaska[1] used an economic model for the placer mining industry in that state and quotes income multipliers of 2.14 to 2.54 and output multipliers of 1.71 to 2.01.

Using a round-figure output multiplier of 2, the placer mining industry in British Columbia was responsible for an output of $50 to $74 million per year during the study period. This survey showed that the industry is dominated in numbers by hand operations and operations processing less than 40 cubic metres of gravel per day, and in expenditures by a comparatively small number of large operations processing 200 cubic metres or more gravel per day. Average expenditures were consistently higher than median expenditures, often by an order of magnitude or more, in every category examined.

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1 The Role of Placer Mining in the Alaska Economy - 1985, State of Alaska Department of Commerce and Economic Development, Office of Mineral Development.

The industry appeals particularly to people who either have heavy equipment available from prior occupations or who have heavy equipment operating or servicing experience. Placer mining also clearly appeals to people as a retirement activity.

The major equipment items used on the average placer mine are old. In 1986, over 10 per cent of total expenditures were used on equipment maintenance, compared to only 26 per cent on new purchases.

Most mining operations employ a "traditional" equipment setup: loader or excavator feeds gravel into a washing and screening plant, with the undersize passing through a sluice box to recover the gold. More modern equipment for gravity separation of minerals such as jigs, spirals and shaking tables is uncommon. Although such equipment is expensive, the cost is comparable to the sums many miners appear ready to spend on more traditional equipment, and the cost could be offset by improved gold recovery, particularly recovery of fine gold. The lack of more modern equipment may be due to lack of expenditure on or availability of consultants services, and the consequent lack of sound technical advice on which to base equipment choices.

Expenditures on testing and exploration in general, and on consultants services in particular, appear low. Field observations commonly indicate inadequate testing is done before production is attempted, and expenditures on testing commonly lack a proper technical foundation. It is perhaps no coincidence that miners engaged in testing programs report the highest average number of years of experience of all operational categories (Figure 2) - they may have learned the value of testing only through that experience.

Expenditure patterns indicate that placer miners rely on sources of supply close to their residences for a large percentage of their mining needs. There is obviously potential for established and new local suppliers to enlarge their share of a valuable seasonal market, particularly in the supply of fuels, consumable items, equipment maintenance and miscellaneous other services.

ACKNOWLEDGEMENTS

We are particularly indebted to the placer miners of British Columbia, who ensured success of this survey by responding in a most gratifying manner to a lengthy questionnaire requiring considerable information. We are also especially indebted to the survey of the placer mining industry conducted by the State of Alaska, referred to earlier, for an example of a successful format for a placer mining questionnaire which we have followed freely.

We would also like to thank the following Ministry personnel: T.G. Schroeter, Senior Regional Geologist, for bringing the Alaska survey to our attention; P. Ostergaard, Senior Coordinator, Project Analysis Branch, for providing much useful information on resource industry surveys; D. Flynn, Inspector of Mines, Smithers, who distributed the questionnaires to miners in the Atlin, Liard and Skeena

Mining Divisions; N. Wood, who looked after the mailings from the Prince George office and input the coded data into the microcomputer, and to T. Burroughs for preparation of the draft.

APPENDIX 1

Province of
British Columbia

Ministry of
Energy, Mines and
Petroleum Resources

1652 Quinn Street
Prince George
British Columbia
V2N 1X3
Phone: (604) 565-6125
(604) 565-6694
(604) 565-6695
(604) 565-6696

OBJECTIVE OF SURVEY

The major objective of this study is to determine the economic impact of Placer Mining on the communities near your mine and on British Columbia as a whole. To do this, information is needed on the level of purchases you or your company made from other companies or individuals and on the proportion of these purchases from British Columbia sources.

CONFIDENTIALITY OF YOUR INFORMATION

To ensure confidentiality of your information, you are asked not to give your name or the exact location of your mine. The number on the questionnaire identifies you only to ensure the integrity of the survey and to send reminders to those who have not responded. Once your completed questionnaire has been received by us, your name will be crossed off the mailing list, the number will be clipped and the information you have submitted will become anonymous. A summary of the survey results will be sent to each party who completes the questionnaire.

COSTS

Please round off cost figures to the nearest $100. If you do not have detailed cost information, please give your best estimate to the nearest $100.

_____

PLACER ECONOMIC SURVEY

GENERAL INFORMATION

Q1. What Mining District is your mine located in? _____

Q2. How many years have you been placer mining? _____

Q3. What was your area of employment before placer mining?

Q4. If you are a part-time placer miner, what other activity or area of employment do you engage in?

Q5. If you were not placer mining, what other activity or area of employment would you engage in?

( ) same as Q4. above
( ) unemployed
( ) retired
( ) other - please identify: _____

Q6. Is your permanent residence located

( ) within 50km of mine site?
( ) within 200km of mine site?
( ) over 200km from mine site but within B.C.?
( ) outside B.C.?

Q7. At what level of operation was your mine in 1986?

( ) inactive - please go to Question 14.
( ) hand operation.
( ) mechanical testing or exploration.
( ) production: under $40m^3$ ($50\ yds^3$) per day.
( ) production: $40\text{-}199m^3$ ($50\text{-}250\ yds^3$) per day.
( ) production: $200\text{-}449m^3$ ($250\text{-}600\ yds^3$) per day.
( ) production: over $450m^3$ ($600\ yds^3$) per day.

Q8. How many months did you work at the mine or on mine-related business this year? _____

Q9. On what day in 1986 did you begin mining operations. (including mobilization, stripping and other mining-related operations)? _____

Q10. On what day did you shut down operations? _____

Q11. How many days in 1986 did you sluice or otherwise process pay gravel? _____

PERSONNEL

Q12. How many people **other than yourself**, worked for the mine in 1986 (include mobilization, logging, stripping, caretaking, winter maintenance and other activities)? _____

Q13. In order to estimate the employment impact of placer mining, it is important to know both how long employees worked on summer and winter activities and, in general terms, where their permanent residence is.

Duration of Employment (to nearest month)	Number of people who live within 50km of mine.	Number of people who live within 200km of mine	Number of people who live over 200km from mine but in B.C.	Number of people who live outside B.C.
1 month				
2 months				
3 months				
4 months				
5 months				
6 months				
7 months				
8 months				
9 months				
10 months				
11 months				
12 months				

(For part-time employees, give the equivalent full time - for example list a 1/2 time employee for 6 months, as working 3 months)

EQUIPMENT

Q14. Please list the major equipment used in your mining operation, such as bulldozers, loaders, draglines, back-hoes, pumps, wash plants, sluice boxes, generators, camp trailers, shop trailers etc. Please include the size of each and how many you have.

Equipment Type, Size and Year	Quantity	Year Purchased or Built	What activity was it purchased for (if not Placer Mining)

EXPENDITURES

Q15. How much did you or your company spend on placer mining in the years 1981 to 1986 on the following commodities? Complete for 1986 and as many previous years as you can.

COMMODITY	1986	1985	1984	1983	1982	1981
FUEL (Diesel, gasoline, propane, lubricants)						
SUPPLIES (tools, lumber, camp supplies, food, steel, welding supplies, other consumable items)						
EQUIPMENT PURCHASE OR RENTAL (Bulldozers, loaders, back-hoes, draglines, pumps and pipe, washing plant, sluice boxes, generators, welders, trucks, trailers)						
EQUIPMENT MAINTENANCE (Parts and non-mine labour)						
SERVICES (Consultants, surveys, accounting, legal, insurance, financial including interest payments)						
OTHER EXPENSES (Mobilization, transport, freight, personnel mobilization and travel, utilities, shop and office rent, refiner's fees, storage and caretaking)						
LABOUR - Note: it is very important to include total employee compensation both in cash and in kind.						
PERMITS, FEES AND ROYALTIES						

Q16. What percentage of the commodities listed in Question 15 for the year 1986 were purchased in the areas listed below?

COMMODITY	Percent purchased within 50km of mine.	Percent purchased within 200km of mine.	Percent purchased over 200km from mine but in B.C.	Percent purchased outside B.C.	
FUEL					=100%
SUPPLIES					=100%
EQUIPMENT PURCHASE OR RENTAL					=100%
EQUIPMENT MAINTENANCE					=100%
SERVICES					=100%
OTHER EXPENSES					=100%

EXPLORATION

Q17. During the last six years, have you undertaken any exploration programs to locate reserves on other leases or beyond your current mining area? Yes ___ No ___
If "yes" please complete below.

	COST	YEAR(S)
DRILLING		
GEOPHYSICS		
CONSULTANTS EXAMINATIONS		
TEST PITS, TEST TRENCHES, TRIAL PROCESSING		

OPERATIONS

Q18. During the last 6 years, have you changed your gold recovery equipment by adding any of the following items? Yes ____ No ____

If "Yes" please complete below:

EQUIPMENT	COST	YEAR PURCHASED OR BUILT
Vibrating Screen		
Vibrating Grizzly		
Trommel		
Mechanical Feeder		
Other Classification Methods - Describe: _____ _____ _____		
Jigs		
Spirals		
Gold Recovery Methods Other Than Sluices - Describe: _____ _____ _____		

Thank you for taking the time and trouble to complete this questionnaire. If you have any questions or comments concerning the questionnaire, please call Doug Flynn at 847-7383 (for Atlin and Liard), or Brendan Gordon or Ted Faulkner at 565-6125 (for Cariboo, Omineca and other districts).